Molecular and biochemical studies of fragrance biosynthesis in rose

Sun, P.

Publication date
2017
Document Version
Other version
License
Other

Université Jean Monnet Saint-Étienne
University of Amsterdam

Discipline: Biologie et Physiologie Végétales
(Plant Biology and Physiology)

Etude de gènes impliqués dans la biosynthèse du parfum chez la rose, *Rosa* x *hybrida*

Molecular and biochemical studies of fragrance biosynthesis in rose

Pulu Sun

2017

Soutenue le 17 Mars 2017 devant le jury:

Mme Danièle WERCK-REICHHART, Directrice de recherche CNRS, Strasbourg	Rapporteure
M. Harro BOUWMEESTER, Professor, University of Amsterdam	Rapporteur
M. Jérémy CLOTAULT, Maître de Conférences, Université d'Angers	Examinateur
Mme Petra BLEEKER, Assistant Professor, University of Amsterdam	Examinatrice
M. Philippe HUGUENEY, Directeur de recherche INRA Colmar	Membre invité
M. Rob SCHUURINK, Associate Professor, University of Amsterdam	Co-directeur de thèse
M. Michel HARING, Professor, University of Amsterdam	Directeur de thèse
Mme Sylvie BAUDINO, Professeur, Université Jean Monnet Saint-Étienne	Directrice de thèse

Molecular and biochemical studies of fragrance biosynthesis in rose

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

op gezag van de Rector Magnificus

prof. dr. ir. K.I.J. Maex

ten overstaan van een door het College voor Promoties ingestelde commissie,

in het openbaar te verdedigen aan de universiteit Jean Monnet St Etienne

op vrijdag 17 maart 2017, te 14:00 uur

door

Pulu Sun

geboren te Guangdong, China

Promotiecommissie:

Promotor:	Prof. dr. M.A. Haring, Universiteit van Amsterdam
Promotor:	Prof. dr. S. Baudino, Université Jean Monnet St Etienne
Copromotor:	Dr. R. C. Schuurink, Universiteit van Amsterdam
Overige leden:	Prof. dr. H.J. Bouwmeester, Universiteit van Amsterdam
	Dr. P.M. Bleeker, Universiteit van Amsterdam
	Prof. dr. D. Werck-Reichhart, Université de Strasbourg
	Dr. J. Clotault, INRA Angers
	Dr. P. Hugueney, INRA Colmar

Faculteit der Natuurwetenschappen, Wiskunde en Informatica

Designed and painted by Lu Zhang
They are :
Rosa x wichurana (Left bottom)
Rosa chinensis cv. 'Old Blush' (Center)
Rosa x hybrida cv. 'Akito' (Right top)
Rosa x hybrida cv. 'The McCartney rose' (Left top and right bottom)

Table of contents

Acknowledgements 1

Abstract 3

Résumé 4

Samenvatting 5

Chapter 1 General introduction 7
- Past and present of rose fragrance 9
- Article: "My Way: noncanonical biosynthesis pathways for plant volatiles" 18
- Research objectives and outlines 33

Chapter 2 Biosynthesis of monoterpene scent compounds in roses 35
- General outline 37
- Article: "Biosynthesis of monoterpene scent compounds in roses" 38
- Supplementary materials for Chapter 2 45

Chapter 3 Nudix hydrolase 1 proteins are key factors of the biosynthesis of both monoterpenoids and sesquiterpenoids in roses 73
- General outline 75
- Nudix hydrolase 1 proteins are key factors of the biosynthesis of both monoterpenoids and sesquiterpenoids in roses 76
- Additional experiments 103
- Supplementary materials for Chapter 3 109

Chapter 4 Transcriptional regulation of *Nudix hydrolase 1* in roses 127
- General outline 129
- Transcriptional regulation of *Nudix hydrolase 1* in roses 130

Chapter 5 *De novo* transcriptome assembly and RNA-Seq analysis for rose petals to discover scent-related genes and transcription factors 153
- General outline 155
- *De novo* transcriptome assembly and RNA-Seq analysis for rose petals to discover scent-related genes and transcription factors 156
- Supplementary materials for Chapter 5 173

Chapter 6 General discussion 197